NORTH ATLANTIC METEOROLOGY.

[*Pressure in inches and millimeters; wind-force by Beaufort scale.*]

NORMAL CONDITIONS.

The normal barometric pressure for December over the North Atlantic Ocean, as deduced from international simultaneous meteorological observations taken at Greenwich noon and not reduced to standard gravity, is lowest, 29.50 (749), in a narrow oval stretching from southern Greenland over Iceland to North Cape. A similar depression, 29.60 (752), extends from the Alaskan Peninsula west to Kamchatka. Pressure is highest during December, 30.20 (767), over a small oval over the south Atlantic and Gulf States; a similar area of highest pressure, 30.50 (775), extends along the border land between southern Siberia and northern Mongolia at N. 50°.

As compared with November, the mean pressure in December is generally lower over the central portion of the North Atlantic Ocean and thence northward over Greenland, Baffin Bay, and northern Europe. It is higher over the greater part of North America.

The general path of storm centers during December passes from the Japanese Islands northeast over the southern extremity of Kamchatka to the center of the Alaskan Peninsula, where it subdivides, one-half going eastward into British Columbia, the other half southeast into Oregon, from Oregon eastward to the southern border of Newfoundland, thence northeast to N. 55°, W. 15°, where it again subdivides, one-third going southeast to southern Europe and two-thirds northeast to Norway and northern Europe. The region of maximum frequency of storm tracks extends from the Lake region east to Newfoundland, the average being about five per month.

The general velocity of movement of storm centers during December is 36 miles per hour in the United States and 21 miles on the Atlantic Ocean, 24 miles from the Yellow Sea to Kamchatka, and 20 miles over Bering Sea and southward to Oregon.

OCEAN FOG.

The limits of fog belts west of the fortieth meridian, as determined by reports of shipmasters, are shown on Chart I by dotted shading. East of the fifty-fifth meridian fog was reported on 11 dates; between the fifty-fifth and sixty-fifth meridians on 5 dates; and west of the sixty-fifth meridian on 3 dates. Compared with the corresponding months of the last seven years, the dates of occurrence of fog east of the fifty-fifth meridian numbered 7 more than the average; between the fifty-fifth and sixty-fifth meridians, 1 more than the average, and west of the sixty-fifth meridian, 1 less than the average.

OCEAN ICE.

The limits of the region within which field ice or icebergs were reported for December, 1894, are shown on Chart I by crosses.

The easternmost ice (several small bergs, reported on the 9th) was in N. 48° 20′, W. 47° 00′, and the southernmost ice, a berg about 60 feet high, reported on the 12th, was in N. 45° 22′, N. 50° 30′.

In December, 1882, 1883, 1884, 1886, 1888, 1891, and 1892, no Arctic ice was reported near Newfoundland and the Grand Banks. In 1885, several bergs were observed off the Newfoundland coast in the early part of the month. In 1887, a small berg was reported in N. 46° 10′, W. 47° 28′ on the 26th, and a small berg in N. 48° 20′, W. 48° 40′ on the 28th. In 1889, large quantities of Arctic ice were reported over and near the Grand Banks. In 1890, a large berg was observed in N. 49° 39′, W. 47° 50′ on the 13th. In 1893, one small berg was reported in N. 47° 05′, W. 50° 43′ on the 27th; on the 29th, one large berg was observed in N. 47° 16′, W. 49° 36′; on the 31st, in N. 47° 35′, W. 49° 00′, a berg about 60 feet high was reported.

TEMPERATURE OF THE AIR.

[*In degrees Fahrenheit.*]

The distribution of the monthly mean temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart II; the lines are drawn over the high irregular surface of the Rocky Mountain plateau, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

DIURNAL PERIODICITY.

The regular diurnal period in temperature is shown by the hourly means given in Table V for all stations having self-registers.

NORMAL TEMPERATURE.

In Table II, for voluntary observers, the mean temperature is given for each station, but in Table I, for the regular stations of the Weather Bureau, both the mean temperatures and the departures from the normal are given for the current month. In the latter table the stations are grouped by geographical districts, for each of which is given the average temperature and departure from the normal; the normal for any district or station may be found by adding the departures to the current average when the latter is below the normal and by subtracting when it is above.

DEPARTURES FROM NORMAL TEMPERATURE FOR DECEMBER, 1894.

As compared with the normal for December the mean temperatures for the current month were decidedly in excess in Montana, North and South Dakota, Minnesota, Iowa, and Wisconsin, and northward over Saskatchewan and Manitoba. The stations showing the greatest excess were Winnipeg, 10.4; St. Vincent, 9.8; Moorhead, 9.6; Minnedosa, 9.5; Huron, 8.5; Port Arthur, 8.3; Duluth, 8.2.

Considered by districts, the mean temperatures for the current month show the following departures from normal temperatures:

Positive departures: Middle Atlantic, 0.3; south Atlantic, 0.6; east Gulf, 1.1; west Gulf, 1.7; Ohio Valley and Tennessee, 0.8; lower lakes, 2.2; upper lakes, 4.4; North Dakota (extreme northwest), 8.2; upper Mississippi, 4.6; Missouri Valley, 5.1; northern slope, 1.2; middle slope, 0.4; southern slope (Abilene), 0.9; southern plateau, 0.9.

Negative departures: New England, 0.2; Key West, 0.9; middle plateau, 4.5; northern plateau, 2.0; north Pacific, 2.8; middle Pacific, 2.3; southern Pacific, 0.9.

For certain voluntary stations of rather long periods of observation the normal and extreme mean temperatures and the departures are shown in detail in Table X *a*, which is now placed among the meteorological tables instead of being inserted in the text as heretofore.

DAILY AND MONTHLY RANGES OF TEMPERATURE.

The greatest daily range of temperature is given for each of the regular Weather Bureau stations in Table I, which also gives data from which may be computed the extreme monthly ranges for each station:

Greatest daily ranges.—Large values: North Platte, 55; Pueblo, 50; Valentine, 46; Huron, 44; Bismarck, Pierre, and Northfield, 42; St. Vincent, Cheyenne, and Denver, 41; Dodge City, 40. Small values: Astoria, 12; Key West, Fort Canby, and East Clallam, 13; Tatoosh Island, 14; Port Crescent, Port Angeles, and San Francisco, 15; Pysht and Roseburg, 16; Portland, Oreg., and Point Reyes Light, 17; Sacramento and Buffalo, 18.

Extreme monthly ranges.—Large values: Dodge City, 90; Rapid City, 88; Valentine, 86; Wichita, 84; Huron, 83; Bismarck, Pierre, and Pueblo, 82. Small values: Tatoosh Island, 16; Fort Canby, 18; East Clallam, 20; Astoria and San Francisco, 21; Port Crescent and Seattle, 22.

YEARS OF HIGHEST MEAN TEMPERATURE FOR DECEMBER.

The mean temperature for December, 1894, was the highest on record at regular Weather Bureau stations as shown in the following table, which also gives the highest previous record:

Stations.	December, 1894.		Highest previous.	
	Mean temperature.	Departure from normal.	Temperature.	Year.
Moorhead, Minn.	20.6	+9.6	20.3	1881
Tucson, Ariz.	54.0	+2.0	52.9	1881

YEARS OF LOWEST MEAN TEMPERATURE FOR DECEMBER.

The mean temperature for December, 1894, was the lowest on record at regular Weather Bureau stations, as shown in the following table:

Stations.	December, 1894.		Lowest previous.	
	Mean temperature.	Departure from normal.	Temperature.	Year.
Roseburg, Oreg.	37.2	−6.1	37.4	1884
Winnemucca, Nev.	25.3	−6.5	26.4	1891
Carson City, Nev.	31.1	−3.8	32.2	1891

MAXIMUM TEMPERATURE.

The maximum temperatures of the month at regular stations of the Weather Bureau are given in Table I, from which it appears that the highest maxima were: San Antonio, 84; Corpus Christi, Palestine, New Orleans, Key West, and Titusville, 81; Jupiter, Jacksonville, Tampa, 81; Dodge City, 79; Abilene, Savannah, Tucson, 78.

The lowest maxima were: St. Vincent, Spokane, 44; Idaho Falls, Baker City, 45; Moorhead, 46.

YEARS OF HIGHEST MAXIMUM TEMPERATURE FOR DECEMBER.

The maximum temperatures for December were the highest on record at regular Weather Bureau stations, as shown in the following table:

Stations.	December, 1894.		Highest previous.	
	Maximum.	Excess above previous record.	Temperature.	Year.
Kittyhawk, N. C.	73	0	73	*
Hatteras, N. C.	73	+1	72	1894
New Orleans, La.	81	+1	80	*
Corpus Christi, Tex.	81	0	81	1888
Galveston, Tex.	77	+1	76	*
Palestine, Tex.	81	0	81	1890
Dodge City, Kans.	79	+5	74	1893
Wichita, Kans.	74	+1	73	1889
Kansas City, Mo.	70	0	70	1889
Green Bay, Wis.	51	+1	50	*
Huron, S. Dak.	65	+2	63	1888

*Frequently.

MINIMUM TEMPERATURE.

The minimum temperatures of the month at regular stations of the Weather Bureau are given in Table I, from which it appears that the lowest minima were: St. Vincent, —24; Bismarck, —23; Northfield, —22; Williston, —21; Moorhead, Miles City, Valentine, —20.

Among the highest minima were: Key West, 44; San Diego, 41; San Francisco, 40; Los Angeles, 39; Yuma, 37; Point Reyes Light, 34; Tatoosh Island, 33.

YEARS OF LOWEST MINIMUM TEMPERATURE FOR DECEMBER.

The minimum temperatures for December were the lowest on record at regular Weather Bureau stations, as shown in the following table:

Stations.	December, 1894.		Lowest previous.	
	Minimum.	Deficit below previous record.	Temperature.	Year.
Northfield, Vt.	−22	0	−22	1890
Sault Ste. Marie, Mich.	−19	−5	−14	1893
Harrisburg, Pa.	4	−5	9	1892
Parkersburg, W. Va.	−4	−4	0	1892
Lexington, Ky.	−6	−13	7	1892
Savannah, Ga.	12	−3	15	1880
Jacksonville, Fla.	14	−5	19	1880
Titusville, Fla.	18	−14	32	1888
Jupiter, Fla.	24	−12	36	*
Key West, Fla.	44	−2	46	1894
Pensacola, Fla.	14	−3	17	1880
Palestine, Tex.	8	−3	11	1887
Abilene, Tex.	6	−3	9	1886
Wichita, Kans.	−10	−4	−6	1892

*Frequently.

ACCUMULATED TEMPERATURES.

From January 1 to the end of the current month the average temperature for each geographical district was above or below the normal by an amount that is given in the last column of the following table. The accumulated monthly departures from normal temperatures, as given in the second column, may be used for comparison with the departures of current conditions of vegetation from the normal conditions.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+8.9	+0.7	Key West	−7.4	−0.6
Middle Atlantic	+13.4	+1.1	East Gulf	−0.5	0.0
South Atlantic	+5.5	+0.5	Southern plateau	−9.1	−0.8
West Gulf	+2.2	+0.2	Middle plateau	−8.9	−0.7
Ohio Valley and Tennessee	+12.5	+1.0	Northern plateau	−0.7	−0.1
Lower Lake	+22.7	+1.9	North Pacific	−10.4	−0.9
Upper Lake	+29.4	+2.4	Middle Pacific	−9.1	−0.8
North Dakota (Ex. NW.)	+32.4	+2.7	Southern Pacific	−22.2	−1.8
Upper Mississippi	+26.1	+2.2			
Missouri Valley	+26.5	+2.2			
Northern slope	+12.1	+1.0			
Middle slope	+10.7	+0.9			
Southern slope (Abilene)	+7.9	+0.7			

LIMITS OF FREEZING TEMPERATURE.

The region within which the air has had a freezing temperature at some time during the month is bounded by the isotherm of minimum 32°. The isotherm of minimum 40° presents, approximately, the boundary of the region within which severe frosts are likely to have occurred. During the winter season these lines are shown on the chart of total monthly snowfall, No. VI.

The line of minimum 40° passes east and west across the southern end of the peninsula of Florida, the lowest readings at regular stations being 44° at Key West and 24° at Jupiter. This isotherm apparently passes from the Gulf of Mexico on to the mainland some distance south of Brownsville, and, after crossing Mexico, reappears near San Diego. It then skirts the coast of California, touching it only at San Francisco.

The minimum isotherm of 32° crosses the southern portion of Florida, the extreme southern portion of Texas, and then reappears between Tucson and Yuma, passing northward through California, along the Coast Range, until it strikes the Pacific near Eureka; it reappears at Fort Canby and passes northward along the immediate coast of Washington.

In general the entire United States lay within the minimum line of 40° and with few exceptions within the minimum of 32°.

PERIODS OF HIGH TEMPERATURE.

The maximum temperatures of December in the respective States occurred principally at the following periods:

(A) 5th, Washington and Oregon; 6th, Montana, Wyoming, North Dakota, and Kansas; 7th, in central Missouri, Oklahoma, and Iowa; 8th, in southern Texas, Louisiana, Mississippi, central Kentucky and Tennessee, lower Michigan, and Lake Erie.

(B) 11th, Indiana, Ohio, South Carolina, and west Florida; 12th, east Florida, south Atlantic and middle Atlantic coast, southern New England.

(C) 14th, Nebraska, Minnesota, Wisconsin, Upper Michigan; 15th, Virginia; 16th, middle Atlantic States, lower Lake region, and central New England.

PERIODS OF LOW TEMPERATURE.

The minimum temperatures of December in the respective States occurred principally at the following periods.

(A) 27th, Manitoba, North and South Dakota, Nebraska, Minnesota, and western Iowa; 28th, the upper Lake region, Indiana, Illinois, Missouri, Kansas, Oklahoma, Texas, Arkansas, and western Tennessee; 29th, New York, Ohio, the middle Atlantic and south Atlantic States, Florida, and the Gulf coast, including Key West. While this area of minimum temperature spread mostly to the south and east, it also extended somewhat westward, reaching northern Washington and Montana, southern Idaho, Wyoming, and western Colorado on the 28th, and Oregon, Nevada, and Utah on the 29th.

REGIONS OF 20° FALL IN TWENTY-FOUR HOURS.

A fall of temperature of 20°, or more, in twenty-four hours is indicated on the Daily Weather Map by inclosing the region within which this occurs by a heavy dotted line. According to recent instructions such falls are no longer to be regarded as technical cold waves, the exact definition of which is given in the subsequent paragraph. The following list enumerates the regions of 20° fall for the month of December and the dimensions of the principal axes are stated in miles:

(A) 2d, p. m., 300 by 200, central Texas, and 600 by 100, Arkansas and Kentucky. 3d, a. m., 300 by 200, western Tennessee and West Virginia.

(B) 7th, a. m., 400 by 300, northern New England.

(C) 7th, a. m., 300 by 300, North and South Dakota; 100 by 200, Alberta. 7th, p. m., 100 by 200, Assinniboia.

(D) 9th, a. m., 200 by 200, Indiana.

(E) 12th, p. m., 200 by 100, Kentucky. 13th, a. m., 100 by 100, Georgia and South Carolina.

(F) 16th, a. m., 100 by 200, South Dakota and western Nebraska; also, 100 by ——, Assinniboia and Saskatchewan.

(G) 17th, a. m., 1,100 by 400, Manitoba, Ontario, Lakes Superior and Michigan, Illinois, and Indiana. 17th, p. m., 400 (?) by 900 (?), Ontario, Lake Ontario, central New York, central Pennsylvania, and West Virginia. 18th, a. m., 500 (?) by 400, Quebec, New Brunswick, northern New England, northern New York. 18th, p. m., 300 by 500, New Brunswick, northern New England, and Nova Scotia.

(H) 20th, p. m., 400 by 300, Alberta, Assinniboia, Saskatchewan. 21st, a. m., 200 by 200, Wyoming; also, 300 by 200, Assinniboia and Manitoba. 21st, p. m., 700 by 600 (?), Manitoba, Ontario, Lake Superior, North and South Dakota, Minnesota. 22d, a. m., 100 by 300, Missouri, Iowa; also, 600 by 500, Ontario, Lakes Superior, Huron, Michigan, northern Wisconsin. 22d, p. m., 1,000 by 300, Quebec, Lakes Huron and Ontario, northern New York, New England, and New Brunswick. 23d, a. m., 1,100 by 500, eastern New York and Pennsylvania, all of New England, Nova Scotia, New Brunswick, and the Gulf of St. Lawrence. 23d, p. m., 500 by 300, New Brunswick, Nova Scotia, and Cape Breton.

(I) 24th, a. m., 300 by 100, Wyoming. 24th, p. m., 600 by 200, Manitoba, South Dakota, and portions of Minnesota and North Dakota. 25th, a. m., 100 by 200, northern Texas; also, 400 by 300, Nebraska and South Dakota; also, 900 by 400, Manitoba, Ontario, North Dakota, Minnesota, and Lake Superior. 25th, p. m., 300 by 100, Arkansas and Tennessee; also, 900 by 200, Colorado, Kansas, Oklahoma, northern Texas; also, 700 by 300, Ontario, Quebec, northern portion of Lakes Superior and Huron. 26th, a. m., 300 by 100, Louisiana and Mississippi; also, 400 by 300, southern Texas; also, 300 by 200, Colorado and northern Texas; also, 100 by 700 (?), Ontario, Quebec, New Brunswick, and northern New England. 26th, p. m., 200 by 200, Virginia and North Carolina; also, 1,100 by 200, Georgia, Alabama, and southern portions of Mississippi, Louisiana, and Texas; also, about 300 by 400, New Brunswick and Nova Scotia; also, 800 by 400, Saskatchewan, Assinniboia, Manitoba, North Dakota, and Minnesota. 27th, a. m., 700 by 400, northern Florida and southern Georgia, Alabama, Mississippi, and Louisiana; also, 800 by 500, South Dakota and portions of Minnesota, Wisconsin, North Dakota, Montana, Wyoming, and Nebraska. 27th, 8 p. m., 500 by 200, Florida and the coasts of Georgia and South Carolina; also, 400 by 100, Kansas and Oklahoma; also, 400 by 200, Wisconsin, Iowa, and Missouri. 28th, a. m., 100 by 200, southern Michigan; also, 400 by 100, New Jersey, eastern Pennsylvania, New York, and southern New England. 28th, p. m., 100 by 300, Georgia and South Carolina; also, 300 by 200, Maine and portions of Quebec and New Brunswick. 29th, a. m., 200 by 100, New Brunswick. 30th, a. m., 100 by 100, Cape Breton.

(J) 29th, a. m., 200 by 200 (?), Alberta. 30th, a. m., 200 by 100, Montana.

REGIONS OF 20° RISE IN TWENTY-FOUR HOURS.

The daily weather charts show by heavy dotted lines the regions within which the temperature has risen 20° in the preceding twenty-four hours. The following list enumerates all of these regions on the maps for 8 a. m. and 8 p. m., and gives the dimensions of the principal axes in miles:

(A) 2d, p. m., 100 by 100, Manitoba.

(B) 6th, a. m., 400 by 200 and 300 by 200, South Dakota, Nebraska, and Kansas.

(C) 7th, a. m., 200 by 100, Missouri. 8th, a. m., 300 by 300, West Virginia.

(D) 11th, p. m., 300 by 200, Alberta and Montana.

(E) 18th, p. m., 200 by ——, Lake Superior; 19th, a. m., 300 by ——, Ontario.

(F) 18th, p. m., 400 by ——, Alberta, Saskatchewan, and Assinniboia. 19th, a. m., 200 by 200, Saskatchewan.

(G) 22d, a. m., 200 by 100, Virginia.

(H) 22d, a. m., 300 by 200, Gulf of St. Lawrence.

(I) 25th, a. m., 600 by 800, New England, Nova Scotia, New Brunswick, and the Lower St. Lawrence.

(J) 25th, p. m., 300 by ——, Gulf of St. Lawrence and Nova Scotia.

(K) 27th, p. m., 300 by ——, Assinniboia and Saskatchewan. 28th, a. m., 500 by 200, North Dakota and Minnesota. 28th, p. m., 500 by 400, North and South Dakota, Nebraska, Iowa, and southern Minnesota; also, 400 by ——, Lake Superior and northward. 29th, a. m., 300 by 200, upper Lake region, and 100 by 200, Illinois and Wisconsin. 29th, p. m., 200 by 200, upper Lake region; 200 by 100, Tennessee; and 200 by 100,

Texas and Louisiana. 30th, a. m., 200 by 200, Ontario, and 800 by 200, West Virginia, Kentucky, Tennessee, Mississippi, Louisiana, and eastern Texas. 30th, p. m., 300 by 100, New England, and 200 by 100, the coast of Louisiana and Alabama. 31st, a. m., 200 by 100, central Florida.

(L) 27th, p. m., 300 by 500, New England, New Brunswick, Nova Scotia, and the Gulf of St. Lawrence. 28th, a. m., 300 by 300, New Brunswick, Nova Scotia, and the Gulf of St. Lawrence.

(M) 29th, a. m., 200 by 200, Montana.

FROSTS.

The frosts reported by the voluntary observers of the Weather Bureau usually have reference to the injury done to tender plants, and the classification "light" or "heavy" depends almost entirely upon the nature of the plant. In general, it may be assumed that a light frost will injure the most sensitive vegetables that are raised by methods of forcing, while the heavy frosts will injure hardy fruits and grains that ripen in the open air. In both cases, however, the extent of the injury will largely depend upon the location of the plant, namely, whether in a quiet valley or on an elevated spot. The meteorologic phenomenon of hoar frost accompanies the occurrence of a frost properly so called by the agriculturist; a freezing temperature without hoar frost is a dry freeze or a cold wave, according to its intensity The isotherms of minimum 40° and minimum 32° are shown on Chart VI.

The principal frosts of December occurred in the southern portion of the United States in connection with the area of high pressure No. X, and on the dates, 27th, 28th, and 29th, as enumerated in connection with the areas of 20° fall in temperature. The low temperature and the severity of the frost in Florida were quite unprecedented in recent years, and the following extracts from the reports of observers are worthy of record:

Montgomery, Ala.—28th, a light flurry of snow occurred at 5 a. m., lasting till 5.40 a. m. Total amount, trace. Minimum and 8 a. m. temperature, 20. Brisk to high northwest winds prevailed, maximum velocity, 28 northwest, at 5.45 a. m., continuing brisk and high all day. The diurnal range of temperature was remarkably small, the maximum reaching only 23.2—a range of only 3°—and this is the lowest maximum on record. December 20, 1880, the maximum was 24; that of to-day 0.8° lower. After 8 a. m. the sky cleared, remaining so all day. The day was bitter cold and blustery, causing considerable discomfort to the people of this section.

Mobile, Ala.—28th, freezing temperature prevailed all day, and much apprehension is felt over the safety of farm and garden produce. 29th, very high pressure and cold weather, the minimum temperature being 16.1, second to the lowest that ever occurred at this station during the month of December.

Savannah, Ga.—29th, the temperature this morning fell to 12, the lowest ever recorded at this station in the month of December, and as low as ever recorded since the establishment of the Weather Bureau in 1871. 12 was reached but once before, on January 12, 1886.

Jacksonville, Fla.—27th, cold wave; temperature fell from 60, at 8 a. m. of 26th, to 36 at 8 a. m. of 27th; fresh to high west and northwest winds. 28th, cold wave continues; temperatures ranged from 27 to 38; at midnight of this date the temperature had fallen to 19.5, and was going down at the rate of about 1° an hour; from sunset to 10.30 p. m., ice three-quarters of an inch thick froze on a bucket of water on the office roof. 29th, the temperature fell to 14 about 7 a. m., the lowest point recorded since the station was established, and 1.3° lower than the memorable freeze of January 12, 1886; maximum temperature to-day, 34; ice 2½ inches thick froze on water in a bucket in the office.

Titusville, Fla.—29th, the temperature fell rapidly during the night, minimum being 18.5, which is the lowest recorded at this station since it was established, and probably the lowest that has occurred in a great many years. At 8 a. m. the temperature was 20 and partly cloudy, with brisk northwest winds which kept up during the greater part of the day. Mean temperature, 26; a fall of 18° from the mean of yesterday, and 35° below the normal.

Tampa, Fla.—29th, weather last night was extremely cold, and this morning a minimum temperature of 18.9 is recorded. This is 1° lower than the minimum of 1886, as recorded in the January REVIEW of that year. Everything in the shape of vegetation is frozen. Ice to the thickness of from 1½ to 2 inches is general, and in several dwellings ice formed to the thickness of ½ an inch. The weather at 8 p. m. does not give much hope for improvement to-night. 30th, freezing weather continued throughout the night, the minimum temperature at 8 a. m., 22.9. The temperature rose during the day to a maximum of 60.

Jupiter, Fla.—29th, coldest weather since the establishment of the station in 1888. Minimum temperature, 24. Next coldest day, March 3, 1890, minimum temperature, 33.

Key West, Fla.—29th, day opened cloudy and very cold; cleared between 9 and 10 a. m., and remained clear. At 11 a. m., the minimum temperature, 43.6, was recorded; after this there was a slow but steady rise. Since the establishment of this station 43.6 is the lowest temperature recorded during the month of December.

The following table shows the dates of the occurrence of the first light and heavy frosts and the first snow of the season at the respective stations. When the observer makes no mention of frost the first occurrence of a minimum temperature of 32° is selected and the date is given in the table. The dagger at the right of the name of the station indicates, therefore, a minimum temperature of 32° with or without frost:

Dates of first light and heavy frosts and snow, December, 1894.

State and station.	First frost.		Snow.
	Light.	Heavy.	
Alabama.			
Ashville			30
Bermuda			28
Carrollton			30
Cordova			28
Decatur			27
Evergreen			28
Florence			30
Gadsden			30
Greensboro			28
Highland Home			28
Jasper			30
Lock No. 4			30
Madison Station†			30
Marion		6	30
Montgomery			28
Newburg			26
Opelika			27
Oxanna			30
Pushmataha			28
Rock Mills			30
Scottsboro			26
Selma			27
Valley Head			28
Wilsonville			30
Arizona.			
Bisbee		31	
Buckeye†		3	
Dudleyville†		5	
Farleys Camp†		10	
Flagstaff			5
Globe		10	
Keams Canyon			8
Lochiel†		11	
Mount Huachuca†		11	13
Natural Bridge		16	
Nogales†		11	
Oracle†		11	
Phœnix†		3	
Reymert†		24	
Show Low			8
Signal†		12	
Tucson		11	
Yuma	1		
Arkansas.			
Bee Branch			26
Blanchard Springs			30
Brinkley			30
Camden			31
Conway			26
Fayetteville			26
Forrest City			26
Fort Smith			26
Helena			26
Hot Springs			26
Keesees Ferry			10
Little Rock			26
Loanoke			26
Luna Landing			30
Mount Nebo			25
New Gascony			26
Newport			26
Osceola			26
Ozark			27
Pocahontas			26
Rison			25
Rogers			25
Searcy			25
Stuttgart			26
Winslow			26
California.			
Adin			6
Bakersfield		1	
Barstow			8
Berkeley	24		
Escondido†		3	
Eureka		10	
Florin†		24	
Folsom City		25	
Fremontville		1	

State and station.	First frost.		Snow.
	Light.	Heavy.	
California—Cont'd.			
Fresno		2	
Georgetown			6
Grass Valley			9
Healdsburg†		16	
Iowa Hill		10	9
Kono Tayee		24	
Lick Observatory			6
Lodi		10	
Manzana		11	
Mariposa		13	
Milton (near)		25	
Mokelumne Hill		25	
Nevada City			8
Newcastle†		24	
Orangevale†		2	
Oroville†		23	
Palermo		1	
Petaluma†		25	
Redding		10	
Red Bluff		1	
Rio Vista†		24	
Sacramento (W. B.)		1	
San Bernadino		3	
San Diego	9		
Santa Clara†		25	
Shasta Springs			3
Stanford University		25	
Stockton†		25	
Susanville			2
Walnut Creek†		2	
Wheatland		1	
Yreka			5
Delaware.			
Millford			26
Millsboro			31
Seaford			26
District of Columbia.			
Washington (W. B.)			25
Florida.			
Avon Park		29	
Brooksville		27	
Clermont		29	
Eustis		29	
Federal Point		28	
Fort Meade†		29	
Grasmere		29	
Hypoluxo†		29	
Jupiter†		29	
Kissimmee		28	
Manatee†		29	
Merritts Island		29	
Mullet Key		28	
Myers		29	
New Smyrna		29	
Oak Hill		29	29
Ocala†		29	
Orange City		29	
Orlando		28	
Tallahassee		27	
Tampa		29	
Tarpon Springs		29	
Titusville		29	
Georgia.			
Adairsville			28
Alapaha			27
Athens			30
Atlanta			26
Augusta			30
Bainbridge			27
Brag		7	
Canton			28
Clayton			30
Covington			28
Dahlonega			26
Diamond			28
Dublin			30
Elberton			30
Fleming†		1	
Forsyth			30

Dates of first light and heavy frosts and snow—Continued.

State and station.	First frost. Light.	First frost. Heavy.	Snow.
Georgia—Cont'd.			
Fort Gaines			30
Hephzibah		17	30
Lagrange			30
Louisville			31
Macon			30
Marietta			30
Morgan			28
Point Peter†			30
Resaca			28
Rome			30
Thomasville			28
Toccoa			30
Washington			30
Whitesburg			30
Illinois.			
Cairo			26
Clear Creek			27
Halliday			27
Jordans Grove			26
Lagrande			27
Mascoutah			26
Mattoon			27
Mount Carmel			27
Streator			27
Indiana.			
Huntington			25
Laconia			26
Indian Territory.			
Eufaula			29
Healdton			26
Kemp			25
Kansas.			
Abilene			10
Altoona			26
Beloit			10
Burlington			11
Coldwater			25
Coffeyville			26
Concordia			10
Cunningham			10
Downs			10
Eldorado			25
Elk City			25
Emporia			11
Fort Riley			10
Grenola			25
Hays City			10
Ionia			11
Kiowa			25
Lawrence			10
Lebo			11
Macksville			10
Medicine Lodge			25
Minneapolis			10
Ness City			10
New England Ranch			10
Oberlin			10
Oswego			26
Pleasant Dale			10
Quinter			10
Sedan			25
Wakefield			11
Wamego			11
Winfield			25
Yates Center			25
Kentucky.			
Bowling Green			26
Burnside			28
Caddo			26
Canton			26
Eddyville†			26
Falmouth			27
Hendricks			27
Middlesboro			26
Paducah			26
Princeton			26
Russellville			26
Sandy Hook			26
Springfield			26
Louisiana.			
Cameron		27	.....
Farmerville			26
Grand Coteau		27	.....
Hammond		28	.....
Liberty Hill			26
New Iberia		27	.....
New Orleans	20	28	.....
Paincourtville		27	.....
Shell Beach		26	.....
Maryland.			
Charlotte Hall			26
Chestertown			26
Cumberland			26
Denton†			26
Frederick			26
Glyndon			26
La Plata			31
Pocomoke City			26
Princess Anne			26
Solomons†			26
Woodstock			26
Massachusetts.			
Fiskdale			2
Mississippi.			
Agricultural College			27
Bay St. Louis†		27	.....
Brookhaven			28
Clarksdale		4	30
Duck Hill			29
French Camps			28
Fulton			30
Greenville			30
Hattiesburg			30
Louisville			27
Palo Alto			27
Pontotoc			26
Rosedale			30
Stonington			26
Thornton			30
University			26
Vaiden			28
Vicksburg			28
Water Valley			27
Missouri.			
Appleton City			26
Bethany			11
Birch Tree			26
Bluffton			27
Carthage			26
Cowgill			27
Darksville			11
Edge Hill			26
Eight Mile			11
Emma			27
Fayette			11
Fox Creek			26
Gayoso			26
Glasgow			11
Gordonville			26
Harrisonville			10
Hastain			25
Houston			26
Humanville			25
Lamar			26
Lebanon			26
Linn Creek			26
Marble Hill			26
Mexico			26
Mine La Motte			26
Mount Vernon			26
New Boston			1
New Madrid			26
Oakfield			26
Oak Ridge			27
Olden			26
Oto			26
Palmyra			11
Panacea			26
Poplar Bluff			26
Princeton			11
St. Joseph			11
Sarcoxie			25
Shelbina			13
Sublett			11
Tindall			26
Vera Cruz			25
Vermont†			27
Vilas			11
Virgil City			26
Warrenton			27
Wheatland			26
Nebraska.			
Arborville			10
Beaver City			11
Creighton			11
Crete			11
Franklin			10
Genoa			10
Glenwood			10
Hebron			10
Minden			10
O'Neill			26
Palmer			11
Red Cloud			10
Stanton			10
Superior			10
Tekamah			10
Weeping Water			11
West Point			31
Whitman			24
Wilcox			10
York			10
Nevada.			
Downeyville			6
Elko			9
Genoa			6
Halleck			6
Hawthorne			9
Hot Springs			6
Mill City			12
Palisade			6
Reno			6
St. Clair			7
Sunnyside			5
Nevada—Cont'd.			
Toano			6
Terington			6
Winnemucca			5
New Jersey.			
Barnegat			26
Beach Haven			26
Charlotteburg			10
Egg Harbor City			26
Franklinville			26
Friesburg			26
Imlaystown			27
Millville			26
Pensauken			26
Vineland			26
Whiting†			26
Woodbine			26
New Mexico.			
Albert			5
Alma			28
Bloomfield			7
East Las Vegas			8
Galisteo			10
Raton			2
Rosa			5
Roswell			27
Santa Fe			5
Springer			24
North Carolina.			
Chapel Hill			30
Charlotte			27
Currituck Inlet			31
Fair Bluff			28
Falkland			28
Fayetteville			29
Greenville			31
Hatterns		29	28
Henderson			28
Kittyhawk			28
Lenoir			26
Littleton			30
Moncure			29
Morganton			27
Mount Airy			26
Mount Pleasant			26
Newbern			30
Pantego			28
Pittsboro			28
Raleigh			27
Rockingham			28
Salisbury			26
Saxon			27
Selma			28
Sloan			28
Southern Pines			28
Southport			28
Tarboro			28
Willeyton			28
Wilmington			28
Oklahoma.			
Alva			25
Arapaho			25
Burnette			25
Clifton			25
Guthrie			25
Norman			25
Oklahoma			25
Ponca			25
Pond Creek			25
Sac and Fox Agency			25
Stillwater			25
Winnview			26
Oregon.			
Albany			6
Arlington			7
Ashland			6
Astoria		15	6
Aurora			6
Baker City			5
Canyon City			6
Cornelius			5
Eugene			6
Grants Pass			6
Happy Valley			5
Heppner			6
Hood River (near)			7
Jacksonville			7
Joseph			5
Lone Creek			6
McMinnville			8
Mount Angel			7
Pendleton			20
Portland			6
Roseburg			6
Sparta			5
Springbrook			6
The Dalles			7
Vale			5
Williams			6
Pennsylvania.			
Altoona			11
Huntingdon			10
Kennett Square			26
Pennsylvania—Cont'd.			
Pottstown			26
Saltsburg			26
West Chester			26
South Carolina.			
Anderson			30
Blackville			30
Blenheim			28
Branchville			28
Camden			29
Charleston			31
Cheraw			29
Columbia			28
Conway			28
Cross Hill			28
Darlington		7	.....
Effingham			28
Flint Hill			28
Georgetown			30
Greenwood			30
Hollands Store			30
Kingstree			28
Little Mountain			28
Longshore			28
Mount Carmel			30
Pinopolis			28
St. Stephens			28
Shaws Fork			28
Society Hill			28
Statesburg			28
Timmonsville†		29	28
Trenton			30
Trial			28
Watts			30
Yorkville			28
Tennessee.			
Carthage			27
Charleston			28
Clarkesville			26
Clinton			31
Columbia			28
Covington			26
Harriman			30
Jackson			26
Johnsonville			26
Kingston			27
Loudon			30
Memphis			26
Nunnelly			25
Palmetto			30
Parksville			28
Rockwood			30
Rugby			27
Strawberry Plains			30
Texas.			
Amarillo			10
Bellville†		28	.....
Brady		27	.....
Coldwater			10
Columbia†		27	.....
Corpus Christi		27	.....
Flower Bluff†		28	.....
Forestburg†		3	.....
Fort Brown†		28	.....
Fort Stockton		28	.....
Fort Worth†		27	.....
Galveston		28	.....
Happy			25
Hartley			26
Houston†		28	.....
Orange†		27	.....
Rockport†		28	.....
Sierra Blanca†		10	.....
Sulphur Springs		11	.....
Utah.			
Cisco			5
Deseret			30
Fort Du Chesne			7
Koosharem			1
Lake Station			5
Manti			5
Moab			1
Mount Pleasant			5
Parowan			8
Snowville			5
Virginia.			
Alexandria			25
Buchanan			26
Cape Henry			28
Christiansburg			26
Hampton			31
Marion			26
Nottoway			26
Smithville			25
Stanardsville			26
Stephens City			26
Warsaw			27
Washington.			
Aberdeen			6
Centerville			7
Elbe			6
Everett			6
Ferry			7

Dates of first light and heavy frosts and snow—Continued.

State and station.	First frost.		Snow.	State and station.	First frost.		Snow.
	Light.	Heavy.			Light.	Heavy.	
Washington—Cont'd.				*Washington*—Cont'd.			
Fort Canby			6	Union City			6
Index			16	Vashon			7
Lapush			7	Walla Walla			7
Madrone			7	*West Virginia.*			
Pine Hill			1	Central Station			26
Port Crescent			6	Harpers Ferry			26
Pysht			6	Hinton			27
Seattle			6	Leachtown			25
Silver Creek			6	Martinsburg			26
Snohomish			7	Monarch			26
Sunnyside			7	New Martinsville			26
Tacoma			7	Nuttallburg			26
Tatoosh Island			6	Tannery			26

COLD-WAVE SIGNALS.

The principal cold wave of the month was that of the 28–29th, and the warnings issued in its advance for Florida are stated in the history of high area No. X.

The cold-wave signals displayed during this month are to be interpreted in accordance with Instructions No. 76 of 1894, but the modified instructions, No. 3 of 1895, will go into effect January 1, 1895. The details of the current instructions are given on page 449 of the REVIEW for November.

In accordance with these instructions the following cold-wave signals were ordered during the month of December:

7th, 10.20 a. m., Pierre, Cheyenne, Lander, Denver, Pueblo, Valentine, Omaha, Moorhead, St. Paul, Duluth, Minneapolis, Des Moines, Dubuque, Davenport, Keokuk, St. Louis, Springfield, Mo., Columbia, Mo., Kansas City, Hannibal, and La Crosse.

16th, 10.50 a. m., Dubuque, Duluth, La Crosse, Green Bay, Milwaukee, Chicago, Marquette, Sault Ste. Marie, Grand Haven, Port Huron, and Detroit; p. m., Toledo, Sandusky, Cleveland, Columbus, Cincinnati, Louisville, Buffalo, Rochester, Oswego, Ithaca, Erie, Pittsburg, Parkersburg, and Albany.

21st, 10 a. m., Duluth and Marquette; p. m., Green Bay and Alpena.

22d, a. m., Albany, Northfield, Portland, and Boston.

23d, 8 a. m., Cheyenne and Lander; p. m., Rapid City, Pierre, Huron, and Valentine.

24th, p. m., St. Louis, Springfield, Ill., Chicago, Springfield, Mo., Sault Ste. Marie, Alpena, Grand Haven, and Indianapolis.

25th, a. m., Palestine, Fort Smith, Little Rock, Shreveport, Toledo, Sandusky, Cleveland, Columbus, Cincinnati, Louisville, Nashville, Memphis, Buffalo, Rochester, Oswego, Ithaca, Erie, Pittsburg, Parkersburg, Albany, Northfield, Portland.

26th, 4.30 p. m., Lincoln, Kansas City, Yankton, Omaha, Topeka, Sioux City, Des Moines, Dubuque, Davenport, Keokuk, La Crosse, and Milwaukee; p. m., Green Bay, Chicago, Marquette, and Grand Haven.

27th, 10.30 a. m., Lansing, Columbia, Mo., St. Louis, Springfield, Mo., Hannibal, Springfield, Ill., Cairo, Port Huron, Detroit, and Indianapolis; a. m., Toledo, Sandusky, Cleveland, Columbus, Cincinnati, Louisville, Buffalo, Rochester, Oswego, Erie, Pittsburg, and Atlanta.

27th, p. m., San Antonio, Palestine, Galveston, Corpus Christi, Little Rock, Shreveport, New Orleans, Nashville, Memphis, Knoxville, Chattanooga, Vicksburg, Meridian, Montgomery, Portland, Boston, New London, New Haven, and Lynchburg.

28th, a. m., Mobile and Pensacola.

HUMIDITY.

HUMIDITY.

The quantity of moisture in the atmosphere at any time may be expressed by means of the weight contained in a cubic foot of air. This is usually known as the absolute measure and is equivalent to giving the tension or pressure of the vapor, or the temperature of the dew-point. The mean dew-points for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, are given in Table I. The vapor pressures and the resulting dew-points, absolute humidities, and relative humidities are all deduced from observations of the wet-bulb thermometer by means of formulæ and tables that were first devised by August and subsequently modified by Regnault, 1845, and Ferrel in 1885, but which are still considered to be open to further improvement. In a general way the dew-points given in Table I are probably slightly lower than they should be, owing to the omission since 1887 of a correction for barometric pressure. There is also an uncertainty in the psychrometric formula which is only just now beginning to be understood, by virtue of which at temperatures below freezing the dew-points and the humidities are higher than they should be. For these reasons the monthly averages of the dew-points and relative humidities are subject to some uncertainty.

AVERAGE HUMIDITY.

The temperature of the wet bulb of the psychrometer is the temperature at which evaporation is going on from a special surface of water on muslin at any moment, but a properly constructed evaporometer may be made to give us the *quantity of water evaporated* from a *similar surface* during any interval of time. Such an evaporometer, therefore, would sum up or integrate the effect of those influences that determine the temperature as given by the wet bulb; from this evaporation the average humidity of the air during any given interval of time may be deduced. Instead of attempting to make a self-registering wet-bulb thermometer we may use the evaporometer as an equivalent. A formula for determining the average vapor tension during an hour was given in 1887, at page 376 of the Treatise on Meteorological Apparatus and Methods (in the section on the use of the evaporometer as an integrating hygrometer), as based on the careful measurements made by Mr. Desmond Fitzgerald and published in the Transactions of the American Society of Civil Engineers, 1886.

It is much to be desired that one or more new series of measurements of evaporation, wind velocity, temperature, and dew-point be made at high and low stations in instrument shelters similar to those used by the Weather Bureau, in order that a general empirical formula may be devised for use with the evaporometer considered as an integrating hygrometer.

WET-BULB OR SENSIBLE TEMPERATURES.

The sensation of heat experienced by the human body and attributed to the atmosphere depends not merely upon the temperature of the air, but especially upon its dryness and the force of the wind. It would seem that the rapid evaporation from the skin in dry, hot weather reduces the temperature of the layer of nerve cells at the surface of the skin. This reduction is not measurable by thermometers which give the temperature of large masses but is appreciated by the minute nerves that end in those microscopic cells. This reduction of temperature, or sensible coolness, is apparently